

## WHAT IS CLAIMED IS:

1           1.   A system for computing optical flow between  
2 images within an image sequence comprising:

3               an image processor processing the image sequence,  
4 wherein the image processor:

5               derives epipolar geometry for the images  
6 from point matches between the images; and

7               computes optical flow for each pixel within  
8 at least one of the images under a constraint derived  
9 from the epipolar geometry.

1           2.   The system according to claim 1, wherein the  
2 image processor, in deriving the epipolar geometry for the  
3 images, computes sparse optical flow between the images.

1           3.   The system according to claim 1, wherein the  
2 image processor, in computing optical flow for each pixel  
3 within at least one of the images, employs a constraint  
4 derived from a fundamental matrix between the images.

1           4. The system according to claim 1, wherein the  
2 image processor utilizes the constraint derived from the  
3 epipolar geometry in combination with least squares  
4 minimization to compute optical flow for each pixel within  
5 at least one of the images.

1           5. The system according to claim 1, wherein the  
2 image processor utilizes the constraint derived from the  
3 epipolar geometry in combination with robust statistical  
4 methods to compute optical flow for each pixel within at  
5 least one of the images.

1           6. The system according to claim 1, wherein the  
2 image processor computes optical flow  $u, v$  for each pixel  
3 within at least one of the images from  $I_x u + I_y v + I_t = 0$ , where  
4  $I_x$ ,  $I_y$ , and  $I_t$  are known spatio-temporal derivatives of  
5 image intensity at each pixel within the at least one  
6 image, and  $a_{x,y} u + b_{x,y} v + c_{x,y} = 0$ , where  $a_{x,y}$ ,  $b_{x,y}$  and  $c_{x,y}$  are  
7 derived from a fundamental matrix  $F$  between the images.

1           7. The system according to claim 1, wherein the  
2 image processor computes dense optical flow between the  
3 images.

1           8. A system for computing optical flow between  
2 images within an image sequence comprising:

3           a video receiver including an input for receiving  
4 the image sequence;

5           an image processor within the video system  
6 processing the image sequence, wherein the image processor:

7           derives epipolar geometry for the images  
8 from point matches between the images; and

9           computes optical flow for each pixel within  
10 at least one of the images under a constraint derived  
11 from the epipolar geometry.

12           9. The system according to claim 8, wherein the  
13 image processor, in deriving the epipolar geometry for the  
14 images, computes sparse optical flow between the images.

1           10. The system according to claim 8, wherein the  
2 image processor, in computing optical flow for each pixel  
3 within at least one of the images, employs a constraint  
4 derived from a fundamental matrix between the images.

11. The system according to claim 8, wherein the image processor utilizes the constraint derived from the epipolar geometry in combination with least squares minimization to compute optical flow for each pixel within at least one of the images.

12. The system according to claim 8, wherein the image processor utilizes the constraint derived from the epipolar geometry in combination with robust statistical methods to compute optical flow for each pixel within at least one of the images.

13. The system according to claim 8, wherein the image processor computes optical flow  $u, v$  for each pixel within at least one of the images from  $I_x u + I_y v + I_t = 0$ , where  $I_x$ ,  $I_y$ , and  $I_t$  are known spatio-temporal derivatives of image intensity at each pixel within the at least one image, and  $a_{x,y} u + b_{x,y} v + c_{x,y} = 0$ , where  $a_{x,y}$ ,  $b_{x,y}$  and  $c_{x,y}$  are derived from a fundamental matrix  $F$  between the images.

14. The system according to claim 8, wherein the image processor computes dense optical flow between the images.

1           15. A method for computing optical flow between  
2 images within an image sequence comprising:

3           deriving epipolar geometry for the images from  
4 point matches between the images; and

5           computing optical flow for each pixel within at  
6 least one of the images under a constraint derived from the  
7 epipolar geometry.

1           16. The method according to claim 15, wherein the  
2 step of deriving the epipolar geometry for the images from  
3 point matches between the images further comprises:

4           computing sparse optical flow between the images.

1           17. The method according to claim 15, wherein the  
2 step of computing optical flow for each pixel within at  
3 least one of the images under a constraint derived from the  
4 epipolar geometry further comprises:

5           computing optical flow employing a constraint  
6 derived from a fundamental matrix between the images.

1           18. The method according to claim 15, wherein the  
2           step of computing optical flow for each pixel within at  
3           least one of the images under a constraint derived from the  
4           epipolar geometry further comprises:

5                     utilizing the constraint derived from the  
6           epipolar geometry in combination with least squares  
7           minimization to compute optical flow for each pixel within  
8           at least one of the images.

9           19. The method according to claim 15, wherein the  
10          step of computing optical flow for each pixel within at  
11          least one of the images under a constraint derived from the  
12          epipolar geometry further comprises:

13                    utilizing the constraint derived from the  
14          epipolar geometry in combination with robust statistical  
15          methods to compute optical flow for each pixel within at  
16          least one of the images.

1           20. The method according to claim 1, wherein the step  
2 of computing optical flow for each pixel within at least  
3 one of the images under a constraint derived from the  
4 epipolar geometry further comprises:

5           computing optical flow  $u, v$  for each pixel within  
6 at least one of the images from  $I_x u + I_y v + I_t = 0$ , where  $I_x$ ,  $I_y$ ,  
7 and  $I_t$  are known spatio-temporal derivatives of image  
8 intensity at each pixel within the at least one image, and  
9  $a_{x,y} u + b_{x,y} v + c_{x,y} = 0$ , where  $a_{x,y}$ ,  $b_{x,y}$  and  $c_{x,y}$  are derived from a  
10 fundamental matrix  $F$  between the images.